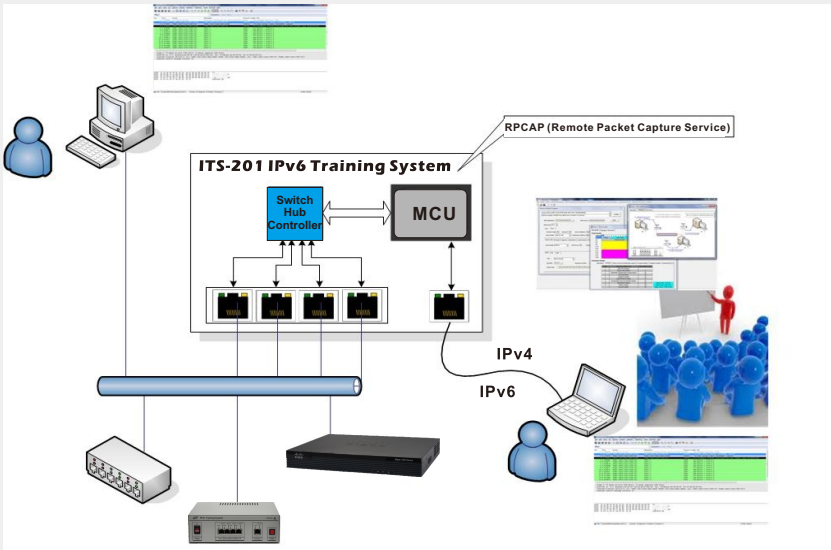
IPv6 Training System

ITS-200 series



Explosive growth in network device diversity and mobile communications, along with global adoption of networking technologies, have overwhelmed IPv4 and have driven the development of a next-generation Internet Protocol (IPv6).In addition to providing more address space, IPv6 not only increases routing efficiency and network-layer security (built-in the IPSec encryption mechanism) but also creates new ways of addressing and more advanced QoS mechanisms, as the protocol develops.

The design purpose of ITS-201(host) one of ITS-200 series is to provide learners with a clear and comprehensive understanding of the protocol and operation of IPv6.

- In order to conveniently observe the various operating behavior of network packet flow under the different protocols, ITS-201 offers a console ethernet port and a 4-port switch hub to set up different network topologies.ITS-201 follows IPv4 and IPv6 Dual Stack protocol. In addition, we design a methodology to capture the network packet flow through console and switch hub port. The RPCAP (Remote Packet Capture) service enables remote network packet browse.A customized graphical interface is designed to send IPv4 and IPv6 network packets. “The Wireshark Network Analyzer” software is used to capture and observe network packets. All experiments are designed following IPv6 RFC standard.
- In order to completely present the function of IPv6 network server and router, Cisco 1905/K9 is specifically selected to serve as DHCPv6 server, router and firewall …etc .
  Cisco 1905/K9 router follows IPv4 and IPv6 dual stack protocol. The embedded IOS system offers a user-friendly platform to operate IPv6 mechanism.

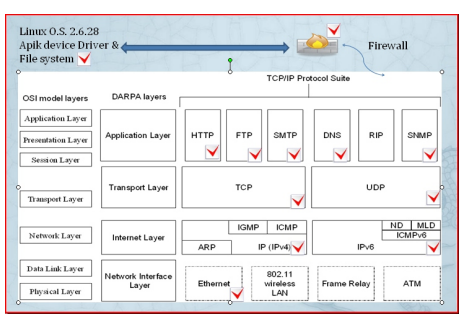
※ **RFC** (Request for Comments) :
Contains technical and organizational documents about the Internet, including the technical specifications and policy documents produced by the Internet EngineeringTask Force (IETF)

ITS-201

Cisco 1905

▶ *Features*

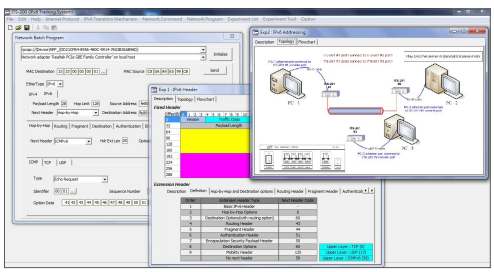
- IPv4 and IPv6 Dual-Stack system
- Support Remote Packet Capture Service (RPCAP)
- Using filterable TAP to complete load-balancing and port-bonding to avoid browsed packet loss.
- Provide GUI software to send and browse IPv4 and IPv6 packet.
  IPv4 : ICMP、TCP、UDP
  IPv6 : support ICMPv6、DHCPv6、Upper-Layer packet format and Next Header with Hop-by-Hop、Routing、Fragment、Destination…etc.
- CONSOLE and PORT1~PORT4 connect ports all support Auto-Negotiation.
- Experiments cover OSI Model 2 ~ 7 layer.



Specification

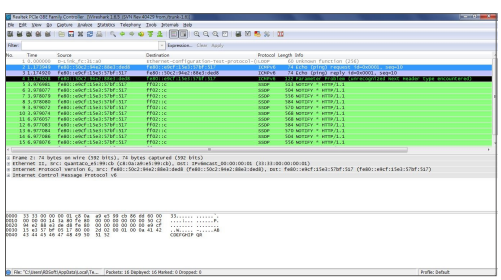
ITS-201

1. **AC power supply：100V-240V AC, 50/60Hz**
2. **CPU: ARM11, 32-bit RISC @667MHz**
3. **Network device : (Auto-Negotiation)**
   (1) Console : 10/100 Mb Ethernet (802.3) 1 Port
   (2) Port 1~4 : 4-port Switch Hub
4. **Embedded multi-tasking operating system**
5. **IPv4/IPv6 protocol stack**
6. **Configuration parameters setting through web browser**
7. **Customized graphical user interface(GUI)**
   (1) Offer different type of IPv4 and IPv6 header to allow user to freely modify and send packet.
   (2) Offer Windows OS IPv6 command list.
   (3) Offer IPv6 experiment list and relevant data.
8. **Enable Remote Packet CAPture service (RPCAP) and use Wireshark software to observe network packets.**

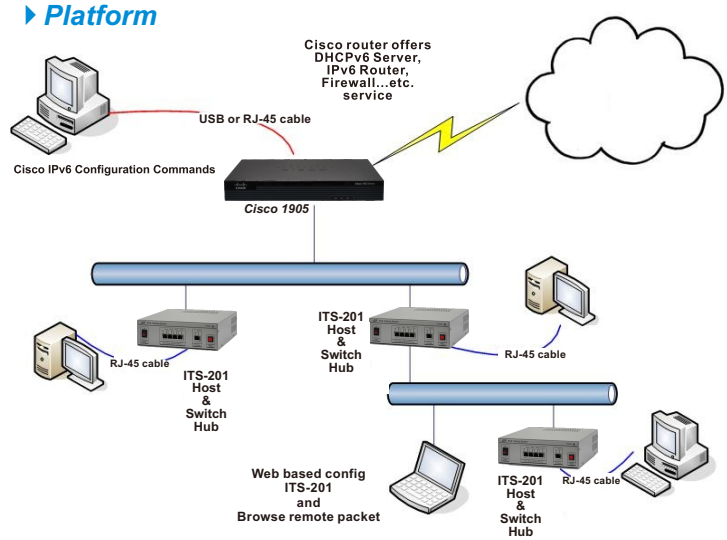


Cisco Router: (Standard : Cisco 1905/K9, Option : Cisco 1905-SEC/K9)

- AC power supply : 100V~240V AC, 47~63Hz
- Embedded IP Security / Secure Sockets Layer (IPSec / SSL) VPN hardware acceleration
- Integrated Gigabit Ethernet ports: 10/100/1000 Gigabit Ethernet WAN-routed ports
- Integrated serial port (HWIC-1T) : for serial WAN connectivity
- Innovative universal-serial-bus (USB) based console access : mini-Type B USB console port supports management connectivity
- IPv4/IPv6 Dual Stack
- IPv6 Transition –Tunnel Mode (Cisco 1905-SEC/K9)
- IPv6 Transition –Translator Mode
- Protocols : IPv4, IPv6, static routes, Open Shortest Path First (OSPF), Border Gateway Protocol (BGP)…etc.
- Encapsulations : Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP), Point-to-Point Protocol over Ethernet (PPPoE), and ATM.
- Traffic Management：QoS, Class-Based Weighted Fair Queuing (CBWFQ), Policy-Based Routing (PBR), Performance Routing (PfR), and Network-Based Advanced Routing (NBAR).



Platform



List of Experiments

Exp. 1 : ITS-201 brief introduction
Unit 1 : ITS-201 hardware
Unit 2 : ITS-201 software

Exp. 2 : Cisco 1905 router brief introduction
Unit 1 : Configuration
Unit 2 : IPv6 Command list

Exp. 3 : IPv6 Header
Unit 1 : send IPv4 packet and the mechanism of RPCAP
Unit 2 : send IPv6 packet and observe the IPv6 header

Exp. 4 : IPv6 Extension Header
Unit 1 : Next Header is Hop-by-Hop Options Header
Unit 2 : Next Header is Fragment Header
Unit 3 : Next Header is TCP Header (HTTP)
Unit 4 : Next Header is UDP Header (DNS)

Exp. 5 : IPv6 Addressing
Unit 1 : Stateful DHCPv6(Dibbler Server/Client)
Unit 2 : Stateless DHCPv6(Dibbler Server/Client)
Unit 3 : Windows command-ipconfig/release6
Unit 4 : Windows command-ipconfig/ renew6

Exp. 6 : DHCPv6
Unit 1 : Stateful DHCPv6(Cisco 1905)
Unit 2 : Stateless DHCPv6(Cisco 1905)
Unit 3 : Stateless Autoconfiguration(Cisco 1905)

Exp. 7 : ICMPv6 – Error Messages
Unit 1 : Destination Unreachable
Unit 2 : Packet Too Big
Unit 3 : Time Exceeded
Unit 4 : Parameter Problem

Exp. 8 : ICMPv6 – Information Messages
Unit 1 : Ping IPv4 address and ARP command
Unit 2 : Ping IPv6 link-local address and NetSH command
Unit 3 : Ping IPv6 global unicast address

Exp. 9 : Neighbor Discovery
Unit 1 : Link-Layer Address Resolution
Unit 2 : Duplicate Address Detection
Unit 3 : Router Discovery

Exp. 10 : IPv6 Transition
Unit 1 : Dual Stack
Unit 2 : Tunnel (6to4,require Cisco 1905-SEC/K9 at option)
Unit 3 : Translator (NAT-PT)

Exp. 11 : IPv6 Gateway and Route
Unit 1 : IPv4 Gateway
Unit 2 : IPv6 Gateway
Unit 3 : Static Route

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